

	Search Text	DBs	Time Stamp
1	(friction adj material) and phenol and fiber and filler	USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM TDB	2003/01/28 09:17
2	(friction adj material) and phenol and fiber and filler and mixing	USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM TDB	2003/01/28 09:17
3	(friction adj material) and phenol and (softening adj temperature)	USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM TDB	2003/01/28 09:44
4	(friction adj material) and phenol and fiber and hexamine	USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM TDB	2003/01/28 10:16
5	(523/149) .CCLS.	USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM TDB	2003/01/28 10:17
6	(523/150) .CCLS.	USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM TDB	2003/01/28 10:17
7	(523/152) .CCLS.	USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM TDB	2003/01/28 10:17
8	(523/153) .CCLS.	USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM TDB	2003/01/28 10:17
9	(523/154) .CCLS.	USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM TDB	2003/01/28 10:17
10	(523/155) .CCLS.	USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM TDB	2003/01/28 10:17
11	(523/156) .CCLS.	USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM TDB	2003/01/28 10:18
12	(523/159) .CCLS.	USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM TDB	2003/01/28 10:18

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13	((523/149) .CCLS.) or ((523/150) .CCLS.) or ((523/152) .CCLS.) or ((523/153) .CCLS.) or ((523/155) .CCLS.) or ((523/156) .CCLS.) or ((523/159) .CCLS.) and phenol and fiber and hexamine	USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB	2003/01/28 10:19
14	((523/149) .CCLS.) or ((523/150) .CCLS.) or ((523/152) .CCLS.) or ((523/153) .CCLS.) or ((523/155) .CCLS.) or ((523/156) .CCLS.) or ((523/159) .CCLS.) and phenol and fiber and (softening adj temperature)	USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB	2003/01/28 10:32
15	((523/149) .CCLS.) or ((523/150) .CCLS.) or ((523/152) .CCLS.) or ((523/153) .CCLS.) or ((523/155) .CCLS.) or ((523/156) .CCLS.) or ((523/159) .CCLS.) and phenol and (mixing near5 temperature)	USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB	2003/01/28 10:40
16	(264/998.13) .CCLS.	USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB	2003/01/28 10:38
17	(friction adj material) and phenol and (mixing near5 temperature)	USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB	2003/01/28 10:40
18	(friction adj material) and phenol and (mixing near3 (temperature or degrees))	USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB	2003/01/28 10:56

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19	((523/149).CCLS.) or ((523/150).CCLS.) or ((523/152).CCLS.) or ((523/153).CCLS.) or ((523/155).CCLS.) or ((523/156).CCLS.) or ((523/159).CCLS.) ) and phenol and (mixing near5 temperature)	USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB	2003/01/28 10:40
20	((523/149).CCLS.) and (degree or degrees)	USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB	2003/01/28 11:20
21	ashland	USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB	2003/01/28 11:20
22	ashland and friction	USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB	2003/01/28 11:21
23	(novolak or resol) and fiber and (mixing same (temperature or degree or degree))	USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB	2003/01/28 11:22
24	(novolak or resol) and fiber and filler and (mixing same (temperature or degree or degrees))	USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB	2003/01/28 11:22
25	((novolak or resol) and fiber and (mixing same (temperature or degree or degree))) and (friction adj material)	USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB	2003/01/28 11:29
26	((novolak or resol) and fiber and filler and (mixing same (temperature or degree or degrees))) and (friction adj material)	USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB	2003/01/28 12:33
27	(friction adj material) and (raw adj material) and process	USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB	2003/01/28 13:09

	<b>Search Text</b>	<b>DBs</b>	<b>Time Stamp</b>
28	((friction adj material) and (raw adj material) and process) and (temperature or degree or degrees) and (softening adj temperature)	USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB	2003/01/28 13:14

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## \* NOTICES \*

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1. This document has been translated by computer. So the translation may not reflect the original precisely.
2. \*\*\* shows the word which can not be translated.
3. In the drawings, any words are not translated.

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## DETAILED DESCRIPTION

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### [Detailed Description of the Invention]

#### [0001]

[Industrial Application] this invention is friction material used as the disk pad of an automobile, brake lining, etc., can suppress generating of dust in the case of the weighing capacity the time of picking out mixed elegance from a mixer, after mixing the raw material of friction material, and before molding, and \*\*\* molding, and relates to the friction material excellent in homogeneity with few segregations of a friction material, and its manufacture method.

#### [0002]

[Description of the Prior Art] Many of non-asbestos system friction material which does not use asbestos uses a graphite, molybdenum disulfide, etc. which have a calcium carbonate, a barium sulfate, and lubricity considering thermosetting resin, such as phenol resin, as a filler component as a binding material, using heat-resistant organic fiber, a glass fiber, a metal fiber, etc. as a fiber component.

[0003] Many phenol resin is used as a binding-material component of friction material. Like drawing 1, generally, in alkali or an acid, a phenol and formalin are made to condense as a catalyst, phenol resin is manufactured [ formalin ], when alkali is used as a catalyst, a thermosetting resol generates it, and when an acid is used as a catalyst, a thermoplastic novolak generates it. When a resol adds heat or an acid, by adding mixed post heating, a hexamine is macromolecule-ized and a novolak joins it again. Moreover, the use which uses a resol for hardening of a novolak in addition to a hexamine is developed.

#### [Drawing 1]

[0004] Generally, since thermal resistance is higher than a resol, the novolak is often used as a binding-material component of a disk pad and the friction material for brake lining. However, since stress corrosion cracking may produce the novolak on a brass rivet etc. when it was pyrolyzed and it applies to clutch facing which ammonia generates and is used by the sealing system, the resol is used about KURATCHIFU-Synge. Generally the above-mentioned thermosetting resin is used as a binding-material component from the former, and friction material is manufactured by mixing and agitating as it is with other fiber components and filler components, and performing molding and heat treatment after that.

#### [0005]

[Problem(s) to be Solved by the Invention] However, since the raw material of friction material has many powdered things, when the dry-blending method currently held from the former is performed, in the case of the weighing capacity the time of taking out mixed elegance, and before molding, and \*\*\* molding, dust may generate these after mixture with agitators, such as a Henschel mixer, and a work environment may get worse. Moreover, when powder which particle size is large and is different is mixed simultaneously, a segregation (the powder of a lower layer and the diameter of a granule inclines [ the powder of the diameter of a large drop ] toward the upper layer) is carried out, and there is a bird clapper that homogeneous friction material is hard to be obtained.

[0006] If liquids, such as an organic solvent and a latex, are thrown in with a raw material at the time of raw material mixture and the wet-blending method mixed and agitated is held in order to prevent this

dust generating and segregation, it is known that it is effective. However, when organic solvents, such as alcohol and a ketone, were supplied, the bad influence to danger, such as a fire, and a human body became a problem. Moreover, although the latex did not have the bad influence to danger, such as a fire, and a human body, when a novolak is used as a binding-material component, it turns out that a novolak red-ization-deteriorates under the influence of the alkaline matter in friction material, and there is a fault which affects the intensity of friction material. If a novolak has OH basis of a large number which are absorptivity in the structure and this touches the latex which is an aquosity liquid for this reason, it is considered to cause red-sized degradation.

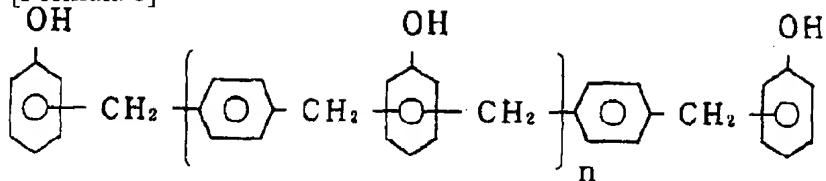
[0007] The leading friction material by which the above-mentioned trouble was moreover solved by such reason using phenol resin similar to novolak type phenol resin or this with high thermal resistance, and its manufacture method are not invented. Then, the technical problem which this invention tends to solve is dust's not being generated at the time of raw material mixture of friction material, but offering friction material which does not carry out a segregation, without [ without it worries about the bad influence to a fire and a human body using novolak type phenol resin, and ] a binding-material component red-ization-deteriorating.

[0008]

[Means for Solving the Problem] this invention is what was made for the purpose of solving the above-mentioned technical problem. the composition (1) In the friction material which contains a fiber component, binding-material components, such as thermosetting resin, and a filler component, and is manufactured through the mixed process of a friction material raw material, a molding process, and a heat treatment process at least The friction material which the principal component of a binding-material component is a phenol aralkyl resin, and is characterized by being obtained by adding and kneading water or a water liquid at the mixed process of a friction material raw material after mixing a raw material, (2) In the friction material which contains a fiber component, binding-material components, such as thermosetting resin, and a filler component, and is manufactured through the mixed process of a friction material raw material, a molding process, and a heat treatment process at least The friction material which the principal component of a binding-material component is a phenol aralkyl resin, and is characterized by being obtained by adding water or a water liquid at the mixed process of a friction material raw material after mixing a raw material, and kneading and corning a raw material, (3) In the friction material which contains a fiber component, binding-material components, such as thermosetting resin, and a filler component, and is manufactured through the mixed process of a friction material raw material, a molding process, and a heat treatment process at least Binding-material components are a phenol aralkyl resin and a hexamine, and the weight ratio of a phenol aralkyl resin (a) and a hexamine (b) is  $a/b=6-17$ . The friction material and (4) fiber components which are characterized by being obtained by adding and kneading water or a water liquid at the mixed process of a friction material raw material after mixing a raw material, and binding-material components, such as thermosetting resin, In the friction material which contains a filler component and is manufactured through the mixed process of a friction material raw material, a molding process, and a heat treatment process at least Binding-material components are a phenol aralkyl resin and a hexamine, and the weight ratio of a phenol aralkyl resin (a) and a hexamine (b) is  $a/b=6-17$ . The friction material characterized by being obtained by adding water or a water liquid at the mixed process of a friction material raw material after mixing a raw material, and kneading and corning a raw material, (5) The water liquid used in case a raw material is kneaded Water or one side of the latexes and a polyethylene oxide, a sodium polyacrylate, It is friction material given in (1) characterized by being mixed liquor with one or more kinds of things chosen from among methyl celluloses, or (4).

[0009] Hereafter, the phenol aralkyl resin used for this invention friction material is explained. Although phenol resin, such as a novolak and a resol, is manufactured like drawing 1 , a phenol aralkyl resin makes a phenol and ARARUKIRUE-Tell condense by the Friedel Crafts reaction, and is obtained, and although it is a kind of phenol resin, it differs from a novolak and a resol. However, a phenol aralkyl resin has the structure very similar to novolak type phenol resin, and when ARARUKIRUE-Tell is alpha and alpha'-dimethoxy paraxylene, it becomes the following structures.

[Formula 1]



Although a phenol aralkyl resin forms the three-dimensions structure of cross linkage by the same heat-curing reaction as a novolak, generally the method has the method of the methylene bridge formation by the hexamine, and the epoxy bridge formation by epoxide. Drawing 2 is the presumed structure at the time of carrying out heat hardening of the phenol aralkyl resin by the hexamine. Drawing 3 is the presumed structure at the time of carrying out heat hardening of the novolak by the hexamine.

[0010] If both are compared, although the methylene group of most phenol aralkyl resin hardened materials is inserted into the phenol nucleus and the phenyl nucleus, the methylene group of most novolak hardened materials is inserted into the phenol nucleus. Moreover, the density of OH basis of a phenol aralkyl resin hardened material is the abbreviation half of a novolak hardened material.

[Drawing 2]

[Drawing 3] From these things, it is guessed that degradation of oxidization degradation of a methylene group being slow and the phenol aralkyl resin hardened material being excellent in thermal resistance and OH basis is excellent in water resistance few.

[0011] In this invention, a phenol aralkyl resin is the substantial principal component of a binding-material component, and it is desirable to contain the whole binding-material component 70% of the weight or more. It is more desirable to avoid combined use of these phenol resin, since the novolak type phenol resin currently used from the former has weak structure in water and the water liquid rather than the phenol aralkyl resin as explanation of an above-mentioned phenol aralkyl resin also shows, and since resol type phenol resin does not have high thermal resistance. When a phenol aralkyl resin is less than 70 % of the weight, when water or a water liquid is touched at a raw material mixture process, it is possible that other binding-material components red--ization-deteriorate or that thermal resistance falls, and there is a possibility of influencing the intensity of friction material.

[0012] It is better to use only the curing agent for stiffening a phenol aralkyl resin and this still more desirably as a binding-material component, although the hexamine, the epoxy compound, etc. might be used as a curing agent for stiffening a phenol aralkyl resin. As a curing agent, a hexamine is still more desirable in respect of thermal resistance, and, as for the content of a hexamine, it is desirable to adjust the weight ratio of a phenol aralkyl resin (a) and a hexamine (b) to the range of  $a/b=6-17$ . The whole friction material is desirable five to 20% of the weight, in 5% or less, the intensity of friction material becomes low and the content of the binding-material component containing a phenol aralkyl resin has a possibility that coefficient of friction at the time of brake braking may become unstable, at 20% or more.

[0013] Next, in this invention friction material, an injection is explained to the friction material of the water carried out at the mixed process of a friction material, and a water liquid. this invention \*\*\*\* -- a water liquid is a liquid which becomes uniform uniformly, without dissociating even if it mixes with water. Although water and a latex are mentioned as a typical thing which can be used for this invention, in order to secure the intensity of friction material, it is good in water and a latex to add a viscous grant agent. Since it is destroyed after dryness and becomes easy to generate dust even if the granulation of the raw material is carried out at the time of kneading when only water and a latex are used, especially the thing for which a viscous grant agent is added is effective. As such a viscous grant agent, water-soluble-polymer material, such as a polyethylene oxide, a sodium polyacrylate, methyl celluloses, and those mixture, is suitable. Moreover, 5 - 50 % of the weight of water or a water liquid is a proper quantity to the whole friction material. If the effect of a case [ less than 5% of the weight of ] of segregation prevention of friction material decreases and 50 % of the weight is exceeded, evaporating moisture will take time and effort.

[0014] after supplying a friction material to agitators, such as a Henschel mixer, and completing mixture, water or a water liquid may be thrown in at once continuously, may be kneaded, is boiled several times and divided -- it is -- it may supply in succession small quantity every, and you may knead Moreover, in case water or a water liquid is thrown into a friction material and kneaded, it is desirable to carry out the granulation of the friction material. By carrying out the granulation of the friction material, this is because a segregation stops being able to happen easily. In order to obtain a granulation article, it is necessary to examine conditions, such as an amount of the capacity of agitators, such as a Henschel mixer, a configuration, the configuration of the wing of an agitator, the rotation conditions of the wing of an agitator, the kind of friction material, water, or a water liquid. About things other than the binding-material component of this invention, metal fibers, such as inorganic fibers, such as organic fiber, such as an aramid fiber, a glass fiber, rock wool, and ceramic fiber, copper, bronze, aluminum, and brass, are mentioned to what is used as a fiber component, and a thing with lubricity like a graphite, molybdenum disulfide, a metal powder, and cashew dust, a barium sulfate, a calcium carbonate, etc. are mentioned to it as a filler.

[0015]

[Function of the Invention] this invention is a thing about the friction material which consists of a fiber component, a binding-material component, and a filler component. Since water or a water liquid can be thrown in at the time of raw material mixture of friction material, without red--ization-degrading a binding-material component as a result of using a phenol aralkyl resin with little density of OH basis as a principal component of a binding-material component It is possible to manufacture the friction material which does not have dust generating at the time of mixture, and was excellent in homogeneity with few segregations.

[0016]

[Example] Next, the example of this invention is explained.

The phenol aralkyl resin which contains cashew dust, NBR powder, a barium sulfate, a mica, a black iron oxide, molybdenum disulfide, graphite, and a silicic-acid zirconium as a filler, and contains a hexamine for bronze fiber, an aramid fiber, and a potassium titanate fiber as a binding-material component was used as a raw material of friction material as an example A-E fiber component. The binding material used for this example is ZAIROKKU resin (XL225MB) by Mitsui Toatsu Chemicals, Inc., and the weight ratio of a phenol aralkyl resin (a) and a hexamine (b) is  $a/b=10$ . It is mixture.

[0017] These friction material raw materials were thrown into the Henschel mixer, first, after mixture was completed, the mixed liquor of water, or a latex and water was supplied continuously, and it kneaded, and the granulation article was obtained. Example A-D supplied water and E supplied the mixed liquor of a latex and water. The numeric value of the column of "the injection object at the time of friction material mixture" of Table 1 shows weight % of the mixed liquor of water, or the latex and water to friction material. then, a friction-material granulation article -- from a Henschel mixer -- taking out -- moisture the metal mold set to the temperature of 160 degrees C after drying at about 60 degrees C until it became 0.5 or less % of the weight -- inside -- direct -- supplying -- pressure 400 kg/cm<sup>2</sup> Heating pressurization molding was performed for 8 minutes. Subsequently, the friction material of example A-E of the composition which heat-treats at the temperature of 240 degrees C for 5 hours, and is shown in Table 1 was obtained.

[Table 1]

		実施例 A	実施例 B	実施例 C	実施例 D	実施例 E	比較例 a	比較例 b	比較例 c
摩 擦 材 組 成  wt %	ザイロックレジン /ポラックスレートレジン	7	7	7	6	7	7	8	8
	青銅織維	12	12	12	12	12	12	12	12
	アラミド織維	3	3	3	3	3	3	3	3
	チタン酸カリウム織維	23	23	23	23	23	23	23	23
	カシューダスト	8	8	8	8	8	8	8	8
	NBR粉末	2	2	2	2	2	2	2	2
	NBRラテックス								
	硫酸バリウム	13	13	13	13	2	2	2	2
	マイカ	9	9	9	9	9	9	9	9
	黒酸化鉄	10	10	10	10	10	10	10	10
混合方式		湿式	乾式						
摩擦材料 混練時の 投入物	水 ラテックス+水 MEK	10	20	30	20	20	20	20	

[0018] In the example of comparison a example A, MEK (methyl ethyl ketone) was supplied instead of water at the time of friction material kneading, and the friction material of the example a of comparison was obtained like Example A.

In the example of comparison b example A, novolak type straight phenol resin was used instead of ZAIROKKU as a binding-material component, and the friction material of the example a of comparison was obtained like Example A.

In the example of comparison c example A, the friction material of the example c of comparison was obtained by the dry-blending method which does not supply water, a latex, etc. After performing preliminary molding after the mixed process end in the example c of comparison, heating pressurization molding was performed. In addition, the numeric value of the column of "friction material composition" of Table 1 shows weight %.

[0019] The result which evaluated the friction material of example A-E obtained as a result of investigating the situation of the manufacturing process at the time of manufacturing the friction material of example A-E and example a-c of comparison by the above-mentioned method, and example a-c of comparison by the full size DYNAMO testing machine is shown in Table 2. Coefficient of friction and the fade of a full size DYNAMO test investigated and evaluated the stability of effectiveness of a brake. The situation of a manufacturing process and the full size DYNAMO test of the friction material of example A-E were good. However, although the example a of comparison had good friction abrasiveness ability and there was no crack initiation, the work environment got worse. The binding-material component red-ization-deteriorated, as a result, friction abrasiveness ability got worse, and the crack generated the example b of comparison in friction material. When manufacturing, dust was generated, and since the example c of comparison was a segregation, the crack generated it.

[Table 2]

		実施例 A	実施例 B	実施例 C	実施例 D	実施例 E	比較例 a	比較例 b	比較例 c
製造工程の状況	粉塵発生状態 有機物質の有無 結合材の赤化劣化 摩擦材偏折発生状態	無 無 無 無	無 無 無 無	無 無 無 無	無 無 無 無	無 無 無 無	無 有 無 無	無 無 有 無	有 無 無 有
フルサイズダイナモテスト	摩擦係数	100°C 200°C 300°C	△ △ △	○ ○ ○	○ ○ ○	△ △ △	○ ○ ○	○ ○ ○	× × ○
	摩耗	100°C 300°C	△ △	○ ○	○ ○	△ △	○ ○	○ ○	× ○
	フェード		△	○	○	△	○	△	×
亀裂発生状況	摩擦面側面 プレート界面	○ ○	○ ○	○ ○	○ ○	○ ○	○ ○	× ×	△ ×

[0020]

[Effect of the Invention] This invention friction material as mentioned above Fiber components, such as an aramid fiber, bronze fiber, and a potassium titanate fiber, It is what consists of filler components, such as the binding-material component which makes a phenol aralkyl resin a principal component, cashew dust, NBR powder, a barium sulfate, a mica, a black iron oxide, molybdenum disulfide, graphite, graphite, and a silicic-acid zirconium. Since there is no aggravation of work environments, such as dust generating at a back process, and the friction abrasiveness ability fall and crack initiation by red-sized degradation of a binding-material component can be prevented as a result of taking in the process which adds and kneads water or a water liquid after mixing these raw materials It is suitable as friction material used for the disk pad of an automobile, brake lining, etc.

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[Translation done.]